CLAIMS:

1. A radiation source comprising a frequency conversion member configured to emit a beam of emitted radiation in response to irradiation with an input beam with a frequency different to that of the emitted radiation, the source being subjected to a magnetic field wherein the free carrier concentration of the frequency conversion member and the applied magnetic field is configured such that the cyclotron diameter of the free carriers of the frequency conversion member is within 30% of their scattering length.

2. A radiation source comprising a frequency conversion member configured to emit a beam of emitted radiation in response to irradiation with an input beam having a frequency different to that of the emitted beam of radiation, the source being subjected to a magnetic field, the magnetic field and fluence of the input beam being configured to minimise the screening effect of free carriers in the frequency conversion member.

3. A radiation source comprising a frequency conversion member configured to emit a beam of emitted radiation in response to irradiation with an input beam with a frequency different to that of the emitted beam, the frequency conversion member comprises a magnetic material dopant.

4. A radiation source according to claim 3, wherein the dopant is Mn.

5. A radiation source comprising a frequency conversion member configured to emit a beam of emitted radiation in response to being irradiated with an input beam with a frequency different to that of the emitted beam, the source being subjected to a magnetic field, the source further comprising means for applying an electric field at the surface of the frequency conversion member which is irradiated by the input beam.

6. A radiation source according to claim 5, wherein the means for applying an electric field comprise a pair of Ohmic contacts provided to the frequency conv rsion member and means for applying a potential difference across said Ohmic contacts.

7. A radiation source according to claim 5, wherein the Ohmic contacts have a substantially triangular shape such that the contacts taper towards one another.

8. A radiation source according to claim 5, wherein the means for applying a field comprises a Schottky gate provided on the surface of the frequency conversion member which is irradiated by the input beam.

9. A radiation source according to any preceding claim, wherein the input beam is circularly or elliptically polarised.

10. A radiation source according to any preceding claim, wherein the magnetic field has a component parallel to that of the emitted beam.

11. A radiation source according to any preceding claim, wherein the emitted beam is produced by reflection of the input beam off a surface of the frequency conversion member.

12. A radiation source comprising a frequency conversion member configured to emit a beam of emitted radiation in response to irradiation with an input beam with a frequency different to that of the emitted radiation, the source being subjected to a magnetic field which has a component parallel to that of the emitted beam of radiation, the emitted beam of radiation being produced by reflecting the input beam off a surface of the frequency conversion member.

13. A radiation source according to any preceding claim, wherein the magnetic field is oriented parallel to the emitted beam.

14. A radiation source according to any preceding claim, wherein the magnetic field is oriented at an angle of at most 20° to the emitted beam.

15. A radiation source according to any preceding claim, wherein the frequency conversion member is selected from InAs, InSb and GaAs.

16. A radiation source according to any preceding claim, configured such that the angle between the input beam and the surface normal of the frequency conversion member is substantially the Brewster angle

17. A radiation source according to any preceding claim, wherein the frequency conversion member is subjected to a magnetic field of at least 2T.

18. A radiation source according to any preceding claim, the source further comprising a magnet to apply the said magnetic field.

19. A radiation source according to nay preceding claim, wherein the emitted radiation comprises at least one frequency in the ranges from 0.1 THz to 100THz.

20. A radiation source according to any preceding claim, wherein the input beam is a pulsed beam.

21. A method of optimising a radiation source, the radiation source comprising a frequency conversion member configured to emit a beam of emitted radiation in response to irradiation with an input beam with a frequency different to that of the emitted radiation,

the method comprising the step of applying a magnetic field to the source, the magnitude of the magnetic field being chosen in order to minimise the screening of the surface field of the frequency conversion member by free carriers in the frequency conversion member for a predetermined fluence of the input beam.

22. A method of optimising a radiation source, the radiation source comprising a frequency conversion member configured to emit a beam of emitted radiation in response to irradiation with an input beam with a frequency different to that of the emitted radiation,

the method comprising the step of applying a magnetic field to the source. the fluence of the input beam being chosen in order to minimise the screening of the surface field of the frequency conversion member by free carriers in the frequency conversion member for a predetermined magnitude of the applied magnetic field.

23. A method according to either of claims 21 or 22, wherein the magnitude of the applied magnetic field or the optical fluence is determined by the steps of:

a) measuring the power of the emitted beam as a function of optical fluence for at least three values of magnetic field;

b) fitting the data measured in a) to the relation:

$$P \propto \frac{n^2 B^2}{m^4} x \left[\frac{\cos\theta_M \sin\theta_M}{2\theta_M} + \frac{1}{2} \right], \qquad (1)$$

where P is the power of the emitted beam, n is the free carrier concentration, m is the effective mass of the carriers, B is the magnetic field and θ_M is :

$$\theta_M(n, B) = \arccos\left[1 - \frac{1}{2}\left(\frac{\lambda}{r}\right)^2 \right], \qquad (2)$$

where λ is the mean free path which is defined as $1/2(n^{-1/3})$ and r is the cyclotron radius;

c) determining the fluence values for the at least three values of magnetic field where with increasing fluence the measured power starts to diverge from the function of step b); and

d) fitting an exponential function to the at least three values determined in point c) such that the optimum fluence can be determined for a given magnetic field or an optimum magnetic field can be determined f r a given fluence.

24. A radiation source as substantially hereinbefore described with reference to any f the accompanying drawings.

25. A method of optimising a radiation source as substantially hereinbefore described with reference to any of the accompanying drawings.